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PORT OF SEDIMENTATION SURVEY

WHITE ROCK LAKE

DALLAS, TEXAS

September - October 1970

UNITED STATES
DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

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Report of Sedimentation Resurvey

WHITE ROCK LAKE

Dallas, Texas

September - October 1970

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Soil Conservation Service

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REPORT OF SEDIMENTATION RESURVEY

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INTRODUCTION

This report presents the results of the second resurvey of sedimentation in White Rock Lake. The survey was made by the United States Department of Agriculture, Soil Conservation Service, Temple, Texas, in cooperation with the City of Dallas. It was made at the request of the Dalworth Soil and Water Conservation District and was conducted during the period September 29 to October 15, 1970.

PREVIOUS SURVEYS

The first survey was made in April 1935 by the Great Plains Sedimentation Party, Soil Conservation Service, Washington, D. C. Field work involved establishing a triangulation net for primary control, locating ranges by stadia, and establishing range end markers as an aid in future surveys. It was reported that a contour map of the basin was prepared before the dam was built, but was lost prior to the 1935 survey. As a consequence, a surface map made in 1923 was used as the base map, and original subsurface profiles were obtained by spudding.[1]

A resurvey of sedimentation in White Rock Lake was made by the Soil Conservation Service, Temple, Texas in March, 1956. In the late 1930's sediment was dredged from segment No. 12 and was deposited primarily in the vicinity of what is presently the west abutment of the Mockingbird Lane overpass. This alteration affected the validity of data obtainable by surveying range 014-015 and this range was therefore eliminated and a new range designated 014A-015A was established upstream from the original range location. In addition, as a result of excessive sedimentation and the extended mapping done in 1935 in the closed arm segments of the lake,[1] segment No. 4 was eliminated, segments No. 8, 9, and 10 consolidated into a single segment (No. 8), and segments No. 13, 14, 15, and 16 also consolidated into a single segment (No. 13).[2]

PURPOSE OF SURVEY

The chief purposes of the investigation were to determine: (1) the rate of sediment deposition in the reservoir; (2) the resultant capacity loss; (3) the characteristics of sediment deposition in the reservoir; (4) the sources of sediment; and (5) the effect and need of conservation treatment in reducing erosion and sediment yield to the reservoir.

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GENERAL INFORMATION

White Rock Lake dam and spillway were built in 1910 as a municipal water-supply reservoir for Dallas. In July of 1930, after completion of Lake Dallas, White Rock Lake was used only for recreational purposes until May 1953. At that time equipment was reinstalled, and use of the water for municipal purposes was resumed during the drought years 1953 to 1957. Since the heavy rains in April and May 1957 the lake has been used solely for recreational purposes.

WHITE ROCK LAKE SYSTEM

Location - White Rock Lake is located within the city limits of Dallas, Dallas County, Texas, approximately 6 miles northeast of the "downtown area". The dam is constructed across White Rock Creek approximately 10.3 miles upstream from its confluence with the Trinity River.

Description of Dam and Spillway - White Rock dam is an earth-fill structure 2,100 feet long with a maximum height above the original streambed of 40 feet. The crown width is 20 feet, and the maximum base width is 214 feet. There is a concrete facing on the upstream side of the embankment. Slopes above crest elevation are 2:1 and 3:1.

The concrete spillway is located at the southeast end of the dam. It is 450 feet in length and has below it a long, broad, concrete apron. The original elevation at the spillway lip was 457.45 feet above mean sea level. The lake elevation could be raised approximately two feet higher by placement of flash boards in a channel extending across the spillway. There was a walkway, supported by piers, above the spillway, which extended from the dam to the left abutment (see Figure 1a). In 1966 the city removed the cat-walk, piers, and channels from the top of the spillway, and recapped the spillway lip with concrete so as to present a fairly smooth surface. This raised the mean sea level elevation of the spillway lip to 458.03 feet. There are two weir-type notches in the spillway, approximately 2.5 feet deep, which normally are sealed by insertion of boards. These boards can be removed when necessary in order to lower the lake level (see Figure 1b). The datum used to compute the present lake capacity was 458.0 feet above mean sea level.

The Reservoir - Storage began in White Rock Lake in April, 1910. The original surface area of the lake at spillway crest elevation was 1,254 acres, and the original capacity was 18,158 acre-feet. During the flood of September 21, 1964, water in the lake reached an elevation of 465.60 feet. This was more than 8 feet above spillway crest elevation. In March, 1956, at the height of a six-year drought period, the water surface elevation reached a low of 450.7 feet above mean sea level.

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Figure 1

White Rock Lake Spillway

a. Spillway showing elevated walkway as it existed prior to 1966.

b. Present spillway showing weir-type notches with boards removed.

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THE WATERSHED

Physiography and Geology - White Rock Lake watershed is a part of the Trinity River watershed in Dallas and Collin Counties. It has a total area of 99.1 square miles, 97.4 square miles of which contribute sediment, the remainder being covered by the lake. The watershed is 22.9 miles long and has an average width of 4.35 miles.

The area is gently rolling, has very few steep slopes, and has a well developed drainage system. Total relief is about 300 feet. Elevations range from 415 feet above mean sea level at the base of the dam to about 700 feet at the watershed divide southeast of the town of Frisco in Collin County.

The watershed is underlain by the Austin Group of Cretaceous Age. It consists of alternate beds of white chalky limestone, limy marl, and shell marl. Weathering of these materials has produced the deep, fertile soils characteristic of the rich Blackland Prairie.

Climate - The watershed is located in an area characterized by a moist, subhumid climate. The mean annual temperature is 66 degrees Fahrenheit, ranging from 46 degrees in January to 86 degrees in July. The average relative humidity is about 63 percent. The prevailing surface winds are southerly. Strong winds from the north occur frequently during winter, but their duration is fairly short.

The average annual precipitation in Dallas is 34.55 inches. The annual precipitation for the 14.6 year survey period averaged 38.40 inches. With the exception of the summer months, rainfall is fairly evenly distributed throughout the year, though usually the maximum occurs in April and May, and the minimum occurs in August. A large part of the annual precipitation comes in thundershowers that occasionally are heavy for brief periods. Consequently, a part of the rainfall is usually lost to the soil because runoff is rapid. Mean annual lake evaporation is estimated at 56 inches, two-thirds of which evaporates in the warm season, May through October.[3]

Land Resource Area and Soils - The watershed of White Rock Lake lies entirely within the Texas Blackland Prairie Land Resource Area. The soils of the area belong to the Houston Black-Austin Association. This association consists of gently sloping soils on the uplands.

The Houston Black soils are gently sloping and have a very dark gray, calcareous clay surface layer that is generally underlain by chalk at depths of about 40-70 inches. These are the most extensive soils in the drainage area.

The Austin soils usually occupy steeper slopes than the Houston Black soils. They have a dark grayish-brown, calcareous, silty clay surface layer about 16 inches thick. The subsoil is light brownish-gray to pale-brown silty clay and overlies beds of chalk at depths of about 42 inches.

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Other soils of the association in this area are the Heiden, Stephen, Eddy, Lewisville, and Altoga soils.

Soils of the Trinity series occur on the flood plains. They have been derived from alluvial materials originating mainly from areas of Houston Black, Austin, and Heiden soils. They have a very dark gray, calcareous clay surface layer. Below this layer is dark-gray, very firm clay several feet thick.

Land Use - Following is a tabulation comparing the land use in 1935, 1956, and 1970.

Land Use	1935 Acres	1935 Percent	1956 Acres	1956 Percent	1970 Acres	1970 Percent
Cropland	44,397	70	30,444	48	18,393	29
Formerly Cultivated	1,902	3	4,440	7	-	-
Pastureland	8,998*	14	15,856	25	7,611	12
Woodland	3,172	5	2,537	4	634	1
Urban	3,805	6	9,052*	14	35,033	55
Lake Area	1,150	2	1,095	2	1,119	2
Miscellaneous1/	-	-	-	-	634	1
Totals	63,424	100	63,424	100	63,424	100

* Lake area subtracted from original acreage.
1/ Includes highways, roads, railroads, farmsteads, etc.

Approximately 85 percent of the Dallas County portion of the watershed is now in urban development consisting of roads, homes, apartments, business places, and other urban uses. The remaining 15 percent consists of land being used for various agricultural purposes and which will soon be developed. Grazing of riding horses is the primary use, with some areas still being used for hay land and general farming.(4)

Agriculture still constitutes the major land use in the Collin County portion of the watershed. However, the southernmost portions of this county are increasing in urban and suburban growth, and indications are that this growth will continue. These areas have become so-called "bedroom" cities for Dallas and Richardson workers, and many of them are purchasing land for summer homes or part-time rural living. Still others are adding to the trend by buying 5 to 30 acre tracts of land for "ranchettes". This is bringing an increase in total ownerships and a corresponding decrease in size per owner. Types of farming operations have also changed. There is an increase in horse farming units and an increase in pure bred cattle operations. The major crops grown in Collin County are cotton, grain sorghums, and small grains.

Erosion and Sediment Yield - Erosion from agricultural land in the watershed has been significantly reduced since 1956 as a result of improved land use and treatment practices. However, as shown in items 37b and 37c

in Table 1, there has been an increase in these Period Capacity Loss columns for 1970. This increased rate in sediment deposition in White Rock Lake can probably be accounted for as the result of two conditions. These are: (1) the increase in urban growth; and (2) a higher rate of precipitation. Because there are no sediment recording gages in the watershed and most of the runoff gages were not installed before 1962, detailed analyses of sediment discharge to water discharge for given storm events during the period 1956 to 1970 are not possible. However, since we can relate the factors of urban growth and increased precipitation to other watersheds[6] where very detailed measurements have been made, it is possible to relate these data to what has occurred in the White Rock Lake watershed area.

Prior to 1956 the principal source of sediment deposited in White Rock Lake was from sheet erosion on cultivated land. Erosion of gullies such as those produced by unprotected terrace outlets and roadside ditches and a slightly lesser amount produced by streambank erosion were the major secondary sources of sediment yield.[7] Agricultural land occupied 84 percent of the watershed area in 1956, while urban land accounted for only 16 percent.

For a watershed of this type, where the greater part of land is used for agricultural purposes, the relationship of runoff to rainfall and its effects on sediment yield can vary widely. The runoff from the drainage area must be considered in relation to many factors. Among these are season of the year, antecedent precipitation and soil moisture, infiltration capacity and type of soils, rainfall intensities, topography, and channel density. This relationship applies presently to the upper 42 percent of the watershed which constitutes the entire portion of agricultural land.

The continuing growth and concentration of population in urban and suburban areas in the last decade has caused many complex problems. The interrelationship of man and his use and development of the land and water resources is a particularly significant aspect of urbanization. As urban man changes an area from one of fields and woodlands to one of buildings and streets, he covers land where once water entered the soil, and thus creates or aggravates problems of drainage, including storm-water runoff.[8]

As a city or residential community builds, much of the cover of natural vegetation is removed, numerous excavations are made, natural drainage is restricted or eliminated entirely in many places, roads and streets are cut across the natural drainage patterns, and the biological balance within the soil is disrupted. Building sites, stripped bare of all vegetation months in advance of construction, in many cases, are especially susceptible to erosion. Water from adjoining built up areas with increased volume and velocity can move large amounts of soil from these areas. Observations of streams below areas undergoing urban growth show that a heavy load of sediment is transported during and after rainfalls.

Fifty-five percent of the watershed area is presently classified as urban land, an increase of 41 percent since 1956. It is located in the surrounding area of White Rock Lake northward to the vicinity of the Dallas-Collin County

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line. Since, in general, the proximity of sediment sources is a prime factor influencing sediment yield to the lake, and the runoff increases as a result of adjacent built up areas, urbanization accounts for a large part of the increased rate of deposition in White Rock Lake.

This increased erosion and its resultant yield to the lake can last for many months as the land is being converted to highways, residential, business, or other urban uses. After lawns are established and streets, parking lots, and walks are laid, sheet erosion should approximate the moderate rate from good pastureland, although the runoff will increase because of roofs, streets, and sidewalks. This, in turn, will tend to increase roadside, stream channel, and bank erosion. The sediment delivery ratio to the lake will then be somewhat higher than originally unless corrective measures are installed.[9]

In Texas, the Soil Conservation Service computes sheet erosion on agricultural land by use of the Musgrave[10] equation. Qualitatively the primary factors influencing the rate of erosion are known to be: (A) Rainfall characterized particularly by intensities and amounts in their determination of the energy of impact; (B) Flow characteristics of surface runoff particularly as affected by slope degree and slope length; (C) Soil characteristics, particularly those physical properties which affect erodibility; and (D) Vegetal cover characterized by comparative densities.

Flow characteristics have been improved by the installation of terrace systems which shorten the slope length and improved cover on the steeper land slopes. Vegetal cover has been improved by methods which will be discussed in the section of the report titled Soil Conservation. The inherent physical properties of the soil remain the same. The fourth factor, rainfall, has changed.

In the consideration of water erosion on agricultural lands, the primary causal factor is rainfall. In the 21 year survey period from April 1935 to March 1956 the month for each year having the maximum rainfall averaged 7.66 inches. There were five years in which the monthly maximum exceeded 10 inches. In comparison for the 14.5 year survey period, March 1956 to September 1970, the month for each year having the maximum rainfall averaged 9.30 inches, an 18 percent increase. There were four years in which the monthly maximum exceeded 10 inches. Also, the annual precipitation for the preceding period averaged 33.53 inches compared to an average of 38.40 inches, a 13 percent increase, for the present survey period.

In the Musgrave equation, the maximum 30-minute, 2-year frequency (P_{30}) rainfall in inches is used because of the very good relationship of the amount of soil eroded annually to this type of storm. Although the 30-minute period rainfall was not tabulated and compared to the long term average P_{30} rainfall[11] because of the time involved in a study of this type (a 35.5 year period), it is probable that the P_{30} rainfall would be higher during the period 1956 to 1970 in which the monthly maximum and the average annual were higher than the preceding period 1935 to 1956.

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SURVEY METHODS AND CALCULATIONS

The range end markers established during the 1935 survey could not be located. Apparently a few were covered by sediment and others obscured by the dumping of surplus broken concrete along large areas of the shoreline. As a result, using the 1956 survey map and an aerial photograph of the lake, it was necessary for a City of Dallas survey crew to attempt re-establishment of the original range ends. Although the re-established range ends, which for the most part were located at topographically prominent points along the shoreline, appeared to be in the original locations, some were slightly off location as evidenced by comparison of 1956 and 1970 range lengths. However, the difference in locations was considered minor and the sediment deposits were so uniform within the adjacent segments, any discrepancy in segment capacity loss or capacity loss of the reservoir as a whole is considered insignificant.

Segment No. 8, which comprises an east arm of the lake, shows a gain in capacity from 1956 to 1970 (see Table 2). At the time of the 1956 survey, the water surface elevation was approximately seven feet below spillway crest elevation. This segment, which contained an abundance of aquatic plant growth, was apparently difficult to accurately map because of the brushy conditions. During the 1970 survey, at which time the water surface was only a little more than one foot below spillway crest elevation, segment No. 8 was easily mapped with a plane table and alidade, and the present surface area, although it shows to be 35 percent larger in surface area, is considered to be correct.

The water surface elevation was obtained from the U. S. Geological Survey gaging station. Elevations were then taken from the water surface to the range ends by use of a level. A steel airplane cable was tightly stretched from shore to shore on line between the range ends. Floats were tied to the cable to facilitate the cable stretching process and also served, in addition to a patrol boat, as a warning to approaching boats in the area. A boat with a line meter was then attached to the cable and as it traversed along the range, distances were recorded. Water depth measurements were made at regular intervals using a 5-pound conical-shaped sounding pea attached to a copper-cored graduated line.

Sediment samples were obtained with a piston-type sampler which employs a clear plexiglass tube inserted inside the aluminum outer cylinder. The plexiglass tube affords the advantages of non-compression of sediment, visual examination of the sample, complete recovery of the semi-fluid upper layer of sediment, and accurate measurements of sample volume. Recovery was good and representative samples were submitted for testing.

Present capacities were computed using the prismoidal formula as described by Eakin and Brown.[1]

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SEDIMENTATION IN THE RESERVOIR

Character of Sediment - Six sediment samples were taken from the reservoir (see Figure 4 for locations). Because of the length of the sediment sampler, its method of operation, and the shallow water, it was not possible to obtain samples from the upper segments of the lake. However, field inspection of the sediment and samples obtained during the previous survey indicate that the sediment from these upper segments is comparable in composition to those taken in the middle and lower segments. The six samples obtained were similar in texture. They averaged 83 percent clay and 17 percent silt size particles. None contained any sand or large size particles. The sediments are gray to black in color. Deposits in delta areas in the small arms and where White Rock Creek enters the main body of the lake contain an abundance of organic material in the form of dead and decaying tree limbs, twigs, and weeds. Dissolved solids or chemical analyses of the lake water to determine pollutants other than sediment were not made.

Distribution of Sediment - As shown by the segment data, Table 2, the greatest capacity loss due to sediment is in segment No. 13 which has lost 95 percent of its original capacity. The original segments, 14, 15, and 16, were almost entirely filled with sediment in 1935, and segment 13, now the uppermost segment of the lake, had the greatest filling of delta deposits. These segments, later combined into one segment designated as No. 13, had a combined capacity loss of 80 percent in 1935 as compared to only a 7 percent loss in segment 5. At present, segment 5 still has the lowest capacity loss, which is 24 percent. Sediment is fairly evenly distributed throughout the rest of the lake. Segment 8 shows a slight decrease in capacity loss and as previously explained is due to a more accurate mapping of the segment which resulted in an increase in surface acres. The shallow water, at spillway crest elevation, causing the great abundance of aquatic plant growth in the upper segments, has and will continue to be a factor in increased sediment deposition in this area. This vegetation slows the flow of water and allows for increased settling of the suspended sediment.

Volume Weight of Sediment - All samples were taken from areas of the reservoir which have not been exposed to air drying. Volume weights were determined by the Soil Conservation Service Material Testing Section at Fort Worth, Texas. The six samples had an average unit dry weight of 32 pounds per cubic foot. Samples ranged in weight from 27 pounds per cubic foot on range 01-02 to 40 pounds per cubic foot on range 08-09.

The length of the samples averaged about four feet, which in most places is less than one-half to about one-quarter of the total sediment profile. Because of the relatively short sample lengths in regard to the total sediment depth, it was not possible to determine the differences in density from the top to the bottom of the sediment profile. However, in-place densities determined by the use of a radioactive density probe were previously obtained in two reservoirs in the Texas Blackland Prairie in which the sediment characteristics and depth of deposits were very similar to those in White Rock Lake. In these reservoirs the average sediment densities in pounds per cubic foot were as follows:

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1. Sediment surface to 2.0 feet = 20
2. 2.0 to 5.0 feet = 35
3. 5.0 to 15.0 feet = 45
4. 15.0 to 16.0 feet = 55

The average unit dry weight of upland soils is 70 pounds per cubic foot.(7) Based on the average sediment densities obtained during the three surveys of the reservoir and the average densities of upland soils contributing sediment, it can be seen that sediment displaces approximately twice the space in the reservoir that it does as soil in-place.

Trap Efficiency of Reservoir - The trap efficiency of White Rock Lake is estimated to be 93 percent. This was obtained by using curves developed by Brune(12) which relate capacity-inflow to the percent of sediment trapped.

SOIL CONSERVATION

Conservation treatment on lands in the watershed is carried out under the direction of the Dalworth and the Collin Soil and Water Conservation Districts assisted by the Soil Conservation Service work units in Dallas and McKinney. This effective conservation program is based upon the use of each acre of land within its capabilities and treatment in accordance with its needs. The work units have assisted farmers and ranchers in preparing soil and water conservation plans on approximately 13,800 acres, or 53 percent of the agricultural land. The trend of buying 5 to 30 acre tracts of land for "ranchettes" has resulted in many of these not being eligible for conservation plans but are given consultive service and inventories and evaluations.

Agricultural land treatment measures decrease erosion and the resultant sediment yield from cropland and pastureland by providing improved soil-cover conditions. These measures include conservation cropping systems, cover and green manure crops, and crop residue use for cropland. On grassland they include proper use, pasture planting, farm ponds to provide livestock water, and proper distribution of grazing to improve, protect, and maintain grass stands. These measures also effectively improve soil conditions and increase infiltration of rainfall into the soil.

In addition to soil improving and cover measures, land treatment includes contour farming, terracing, and grassed waterways, which have a measurable effect in reducing peak discharge by slowing runoff water from fields and in reducing erosion and sediment damages.

The Soil Conservation Service provides a variety of services to the urban and suburban land user, to units of government, and to planners and developers in the urban area.

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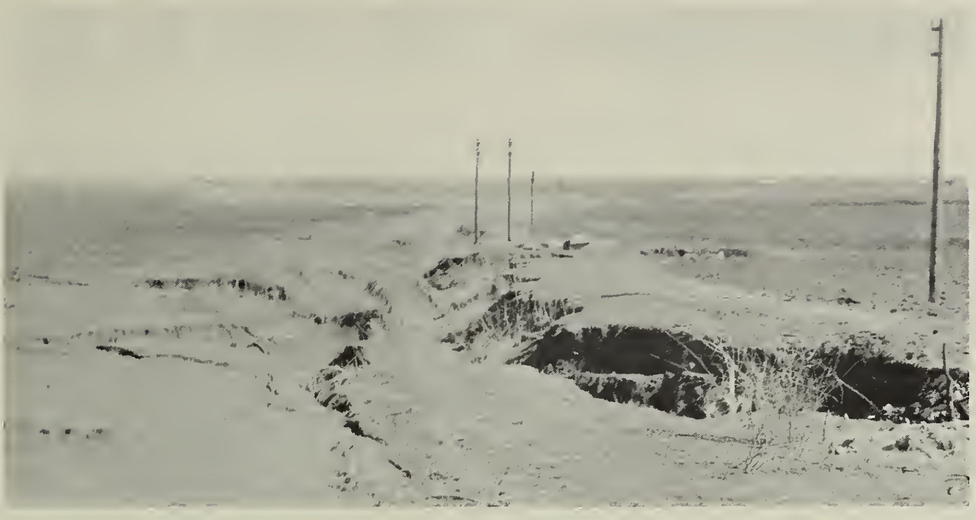
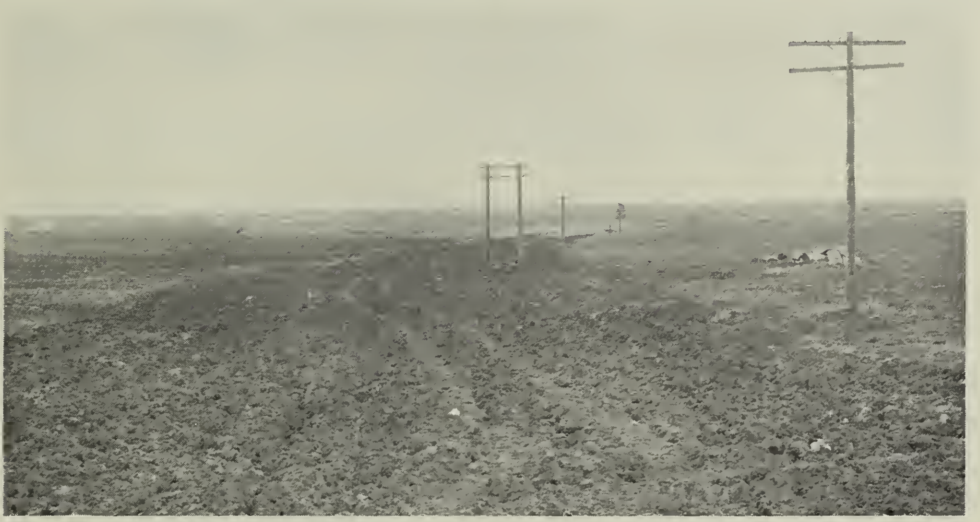
Figure 2



a. Severely gullied joint waterway along a property line.



b. Same gullied area immediately after shaping to a parabolic waterway.

c. Same waterway sodded to common bermuda grass showing good establishment of cover.

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In past years soil surveys by the Soil Conservation Service have been used primarily for agricultural purposes. However, in recent years urban uses of these surveys have increased many-fold as various interpretations are made specifically for development purposes.

The modern soil survey has information about the kinds of soil that occur in the area, with descriptions of their structure, texture, and other physical characteristics. This information can give estimates of porosity and percolation rates, natural soil drainage, ponding, flooding, runoff, depth to bedrock and seasonal high water tables, bearing strength, shrink or swell potential, and frost action. These characteristics are then translated into limitation ratings for various land uses such as residential, industrial, commercial, school sites, and developed and undeveloped recreational areas.

Cities in the watershed are being assisted in the use of soil survey information for such purposes as selection of sanitary landfills, parks, open space, golf courses, and street location.

Assistance is also provided to individual land users in the urban and suburban portion of the watershed in regard to soil and water problems on their land units.[4]

SUMMARY OF DATA

As shown by the Reservoir Sediment Data Summary Sheet, Table 1, the average annual rate of deposition to date in White Rock Lake is 122 acre-feet, which represents an annual rate of 1.25 acre-feet per square mile of watershed area. The reservoir has lost 7,415 acre-feet of its original capacity due to sediment during its 60.5-year life. The total capacity loss of the lake to date is 40.83 percent, an average annual loss of 0.67 percent. The greatest capacity loss is at the upper end of the lake with sediment deposition being fairly evenly distributed throughout the rest of the reservoir.

Conservation treatment of agricultural land in the watershed has considerably reduced erosion and sediment yield, and as a result sediment deposition in White Rock Lake from this source is considered to be of less consequence now than at the time of the 1935 survey.

Erosion control on urban and suburban lands in the watershed has begun, but more needs to be accomplished. Communities - towns, cities, and counties - can help reduce erosion and sediment yields by planning the development of their land and water resources and making their plans binding through zoning regulations. Already many communities require that builders and planners adhere to specific regulations in clearing an area for construction. Some require that urban planning be based on a scientific soil survey. Community land use plans can and should suggest how private and public improvements and land uses can be carried out in the best interests of all people.

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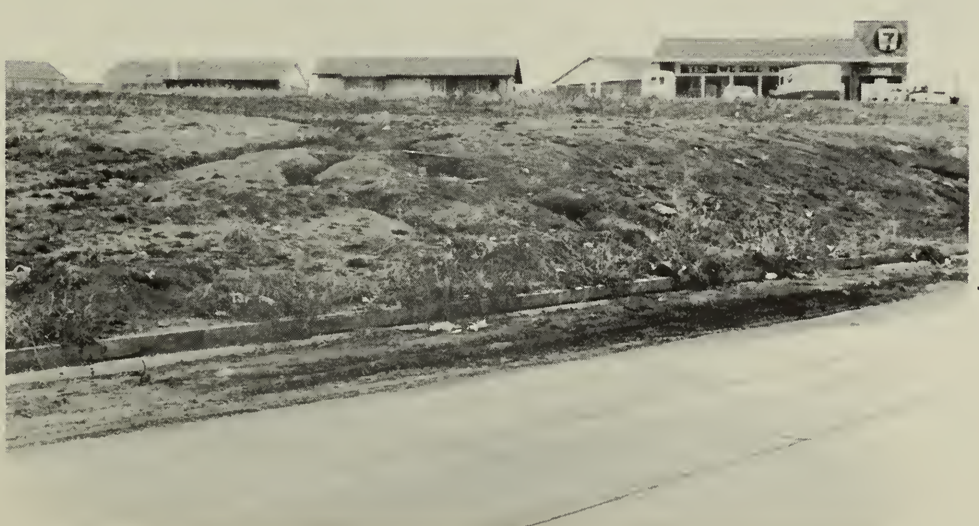
Figure 3

a. Quarter horses grazing heavily fertilized coastal bermuda grass.



b. Vacant lot adjoining developed area has very little cover. Erosion can be evidenced by sediment deposited in street in foreground.

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Although the rate of deposition in the reservoir is considered to be high and only 59 percent of the original capacity remains, two consoling facts should be kept in mind by those interested in the reservoir. Numerous reservoirs in the Blackland Prairie area of Texas have suffered higher rates of sediment deposition than White Rock Lake. In addition, the average annual capacity loss of the reservoir is less than one percent a year. This is due to a very good capacity-watershed area ratio, i.e., 184 acre-feet per square mile of drainage area. Since the average annual capacity loss is gradually decreasing, the reservoir probably has a remaining useful life of from 40 to 50 years. Increased efforts toward reducing erosion and sediment yield in the watershed, particularly in the expanding urban areas, could increase the lake's useful life considerably beyond 50 years.

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TABLE 1

RESERVOIR SEDIMENT DATA SUMMARY

SCS-34 Rev. 6-66

WHITE ROCK LAKE

NAME OF RESERVOIR

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

51-8

DATA SHEET NO.

DAM	1. OWNER City of Dallas	2. STREAM White Rock Creek	3. STATE Texas
	4. SEC. TWP. RANGE	5. NEAREST P. O. Dallas	6. COUNTY Dallas
	7. LAT. 32° 49′00″ LONG. 96° 43′ 45″	8. TOP OF DAM ELEVATION 468.5	9. SPILLWAY CREST ELEV. 458.0

RESERVOIR 10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. ORIGINAL SURFACE AREA, ACRES	13. ORIGINAL CAPACITY, ACRE-FEET	14. GROSS STORAGE, ACRE-FEET	15. DATE STORAGE BEGAN
a. FLOOD CONTROL					April 1910
b. MULTIPLE USE	458.0	1254	18,158	18,158	
c. POWER					
d. WATER SUPPLY					16. DATE NORMAL OPER. BEGAN
e. IRRIGATION					
f. CONSERVATION					1910
g. INACTIVE					

17. LENGTH OF RESERVOIR 2.80 MILES	AV. WIDTH OF RESERVOIR 0.61 MILES

WATERSHED	
18. TOTAL DRAINAGE AREA 99.1 SQ. MI.	22. MEAN ANNUAL PRECIPITATION 34.55 (85) INCHES
19. NET SEDIMENT CONTRIBUTING AREA 97.4 SQ. MI.	23. MEAN ANNUAL RUNOFF 4.29 INCHES
20. LENGTH 22.9 MILES; AV. WIDTH 4.35 MILES	24. MEAN ANNUAL RUNOFF 22,673 AC.-FT.
21. MAX. ELEV. *700; MIN. ELEV. 434	25. ANNUAL TEMP.: MEAN 66°F RANGE 46°F - 86°F

SURVEY DATA

26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA, ACRES	32. CAPACITY, ACRE-FEET	33. C/I. RATIO, AC.-FT. PER AC.-FT.
April, 1910	--	--			1,254	18,158	0.80
April, 1935	25	25	Range	13	1,150	14,276	0.63
March, 1956	20.9	45.9	Detail	9	1,095	12,321	0.54
Oct., 1970	14.6	60.5		9	1,119	10,743	0.47

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET			36. WATER INFL. TO DATE, AC.-FT.	
		a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	a. MEAN ANNUAL	b. TOTAL TO DATE

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET			38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET		
	a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
March 1935	3,882	155	1.60	3,882	155	1.60
March 1956	1,955	94	0.97	5,837	127	1.30
Oct. 1970	1,578	108	1.11	7,415	122	1.25

26. DATE OF SURVEY	39. AV. DRY WGT., LBS. PER CU. FT.	40. SED. DEP., TONS PER SQ. MI.-YR.		41. STORAGE LOSS, PCT.		42. SED. INFLOW, PPM	
		a. PERIOD	b. TOTAL TO DATE	a. AV. ANN.	b. TOT. TO DATE	a. PERIOD	b. TOT. TO DATE
March 1935	49 (8)	1,708	1,708	0.89	21.38	--	--
March 1956	35 (5)	1,297	991	0.70	32.15	--	--
Oct. 1970	32 (6)	505	871	0.67	40.83	--	--

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26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION											
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION											

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR													
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY

47. REMARKS AND REFERENCES

48. AGENCY MAKING SURVEY Soil Conservation Service

49. AGENCY SUPPLYING DATA Sedimentation Survey Party-Texas

50. DATE 3-71

TABLE 2

SEGMENT DATA

WHITE ROCK LAKE

SEGMENTS	PRESENT SURFACE AREA (Acres)	ORIGINAL CAPACITY (Ac.Ft.)	CAPACITY (Ac.Ft.)			SEDIMENT VOLUME (Ac.Ft.)			CAPACITY LOSS (PERCENT)		
			1935	1956	1970	1935	1956	1970	1935	1956	1970
1	15.69	420.42	383.44	311.43	278.81	36.98	108.99	141.61	9	26	34
2	133.00	3,500.01	3,210.31	2,719.46	2,510.45	281.70	780.55	989.56	8	22	28
3	11.50	218.43	178.92	103.52	102.40	39.51	114.91	116.03	18	53	53
5	196.81	4,060.26	3,768.42	3,212.54	3,148.43	291.84	847.72	911.83	7	21	24
6	142.26	2,610.41	2,295.10	1,922.45	1,678.37	314.80	687.96	932.04	12	26	36
7	71.74	1,431.03	1,165.99	917.65	823.13	265.04	513.38	607.90	19	36	42
8 1/	42.09	401.92	206.06	145.35	167.60	195.86	256.57	234.32	48	64	58
11	233.20	3,070.09	2,392.55	1,775.75	1,459.08	677.54	1,294.34	1,611.01	22	42	53
12	183.40	990.87	389.14	969.70	507.56	610.73	-- 2/	483.31 3/	62	-- 2/	49 3/
13 4/	89.50	1,454.06	286.07	243.58	67.44	1,167.99	-- 2/	1,386.62 3/	80	-- 2/	95 3/
TOTALS	1,119.19	18,157.50	14,276.00	12,321.43	10,743.27	3,881.99	-- 2/	7,414.83	79	-- 2/	41

1/ Segments 8, 9 & 10 from 1935 survey combined into segment 8 during 1956 survey.
2/ Capacity loss and sediment volume not applicable due to relocation of Range 014, 015.
3/ Capacity loss and sediment volume compared to 1956 survey data due to relocation of R 014, 015.
4/ Segments 13, 14, 15, & 16 from 1935 survey combined into segment 13 during 1956 survey.

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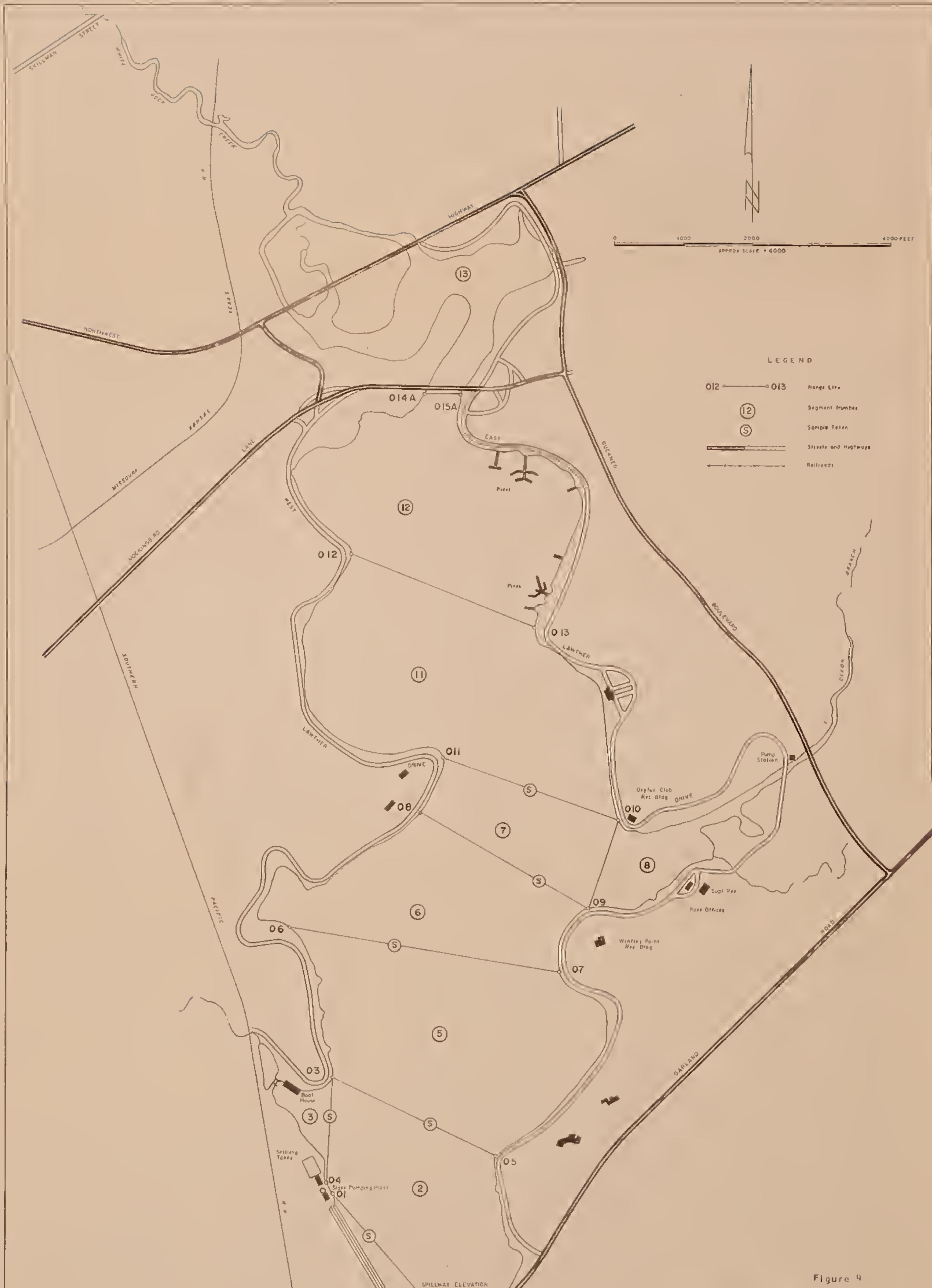

Figure 4

SEDIMENTATION RESURVEY 1970
WHITE ROCK LAKE
DALLAS, DALLAS COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Surveyed	RHZ	1-71
Drawn	RHZ	1-71
Traced	B.P.	2-71
Checked		

4-E-30119

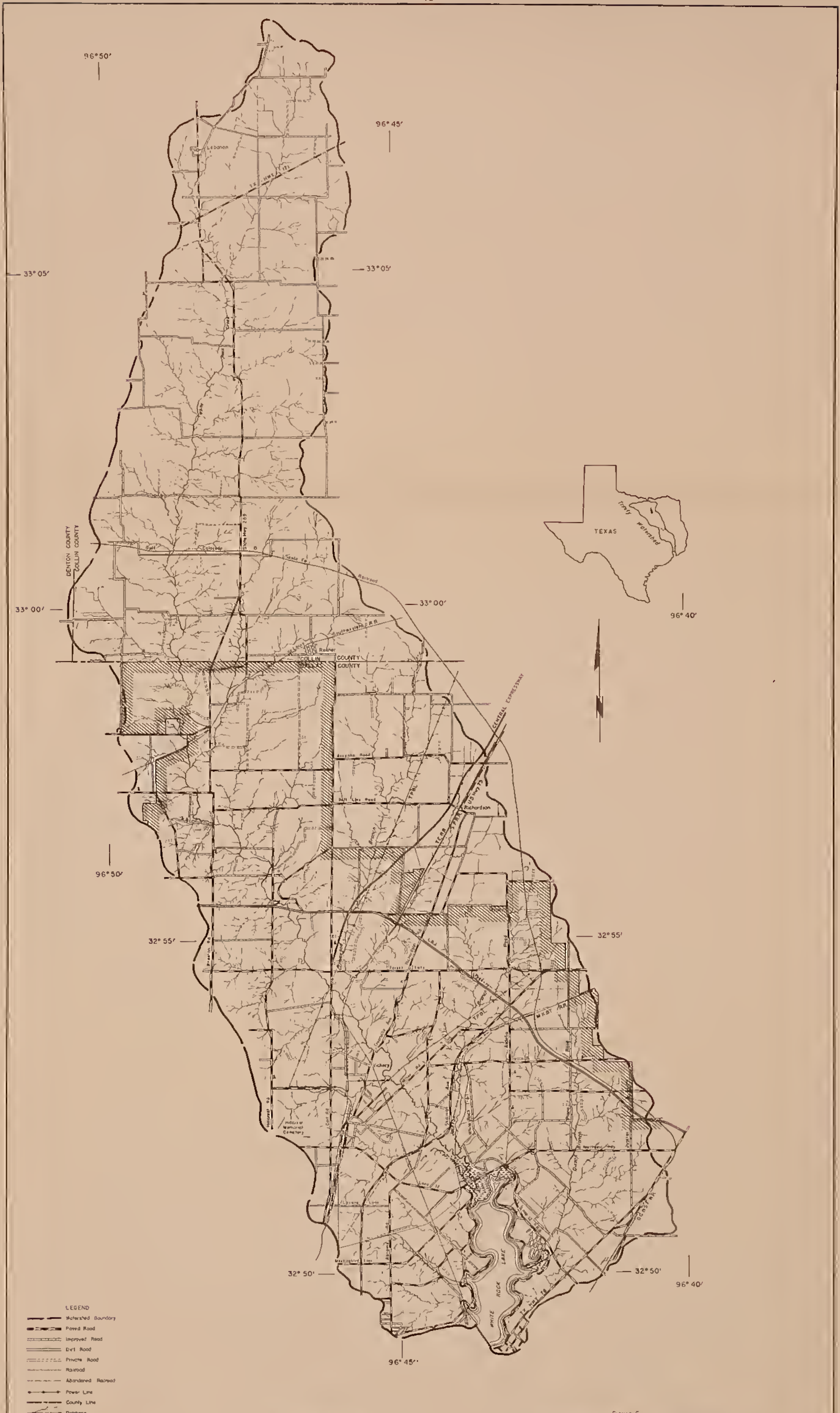

Figure 6

WHITE ROCK CREEK WATERSHED
OF THE TRINITY RIVER WATERSHED
TEXAS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Rev. 1-69

White Rock Lake, Texas — Soil Conservation Service — Soil Mechanics Laboratory Data

F71-		Texas City of Dallas Trinity R. White Rock Lake (Sed.)	Vol. W/S cu. ft.								(sed) Unit dry wt. pcf
943	1	Range 01-02, 7+00	0.0556	62	92	92	95	97	100		26.7
944	2	" 04-03, 5+00	0.0316	54	79	92	96	97	100		32.1
945	3	" 09-08, 7+00	0.0523	[illegible]	74	93	98	98	100		39.5
946	4	" 07-06, 13+00	0.0597	56	79	91	96	97	100		30.4
947	5	" 05-03, 10+00	0.0423	62	87	97	95	98	100		29.8
948	6	" 010-011, 13+00	0.0648	62	[illegible]	97	95	95	100		33.6

White Rock
extra

an